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Prolonged exploitation of coastal resources has caused extensive ecological harm. The alarming decline in the condition of the marine environment has become a matter of serious public concern. This Article will examine some of the environmental problems of the coastal zone and the resulting institutional responses. The first part will delineate a number of problems in the nation's coastal areas. The second part will review the doctrines of property law associated with the ownership of littoral land and their relation to land-use control measures. The third part will evaluate recent coastal management legislation. The fourth part will consider constitutional restraints on governmental action. Finally, the development of a sound public policy dealing with both the needs of the coastal environment and the difficulties of relating this policy to other societal goals will be discussed.

I. COASTAL AREA PROBLEMS

Broadly circumscribing the problem areas of the coastal zone is a relatively easy task; clearly defining these areas is considerably more difficult. The problem areas in coastal zones concern identification of environmental impacts, their causes and their amelioration or resolution.

A. Coastal Zone Environmental Impacts

Composed of various interdependent ecological systems, such as marshes, mudflats, shallow open water, mud and sand bottoms, beaches and dunes, the delicately-balanced coastal environ-

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ment is acutely sensitive to human activities.[1] Consequently, dredging, filling and mining operations, along with the discharge of pollutants from shorebased and mobile sources resulted in the destruction of estuarine areas, beach erosion and the contamination of coastal waters. These have all taken a heavy toll on the living marine environment, causing recreational and aesthetic losses.

Estuarine areas have been particularly susceptible to harm from activities associated with land development.[2] Estuaries are important because of their extraordinary productive capacity[3] and their ability to replenish oxygen for the atmosphere.[4] An estimated two-thirds of all marine animals either spend part of their lives in estuaries or feed upon a species which does.[5] In addition, some twenty million persons use these waters for recreational purposes each year.[6]

Beach erosion is another consequence of land development in coastal areas. Beach erosion may have profound effects on the coastal ecology as well as impairing recreational sites. Erosion results from current and wave action which moves the beach material along the shore in a process known as littoral drift.[7] A problem occurs when more beach material is removed than is deposited.

A short-term rise in the level of the sea has increased natural erosion, but man-made erosion is currently of greater significance. A recent study by the U.S. Army Corps of Engineers revealed serious erosion on 20,500 miles of the 84,000-mile ocean and Great Lakes shoreline. Excluding Alaska, about 43,000 miles or forty-three percent of the remaining shoreline is subject to erosion problems.[8]

1. *See* Cooper, *Ecological Considerations*, in J. HITE & J. STEPP, COASTAL ZONE RESOURCES MANAGEMENT 127, 129 (1971).

2. *See* 1 U.S. COMMISSION ON MARINE SCIENCE, *Engineering and Resources* III-39 (1969). Estuaries are defined as partially-enclosed bodies of water within which there is measurable dilution of sea water by fresh-water run-off. E. PRITCHARD, ESTUARIES 3 (G. Lauff ed. 1967).

3. A Georgia salt marsh can produce several times as much organic matter as an average wheatfield. Teclaff, *The Coastal Zone—Control Over Encroachments into the Tidewaters*, 2 ENVIRON. L. REV. 618, 619 (1971).

4. Leavell, *Legal Aspects of Ownership and Use of Estuarine Areas in Georgia and South Carolina*, 1971 INST. OF GOV'T U. OF GA. 1.

5. U.S. COUNCIL ON ENVIRONMENTAL QUALITY, FIRST ANNUAL REPORT 176 (1970).

6. NATIONAL COUNCIL ON MARINE RESOURCES AND ENGINEERING, FOURTH ANNUAL REPORT, *Marine Science Affairs—Selecting Priority Programs* 47 (1970).

7. F. MALONEY, S. PLAGER & F. BALDWIN, WATER LAW AND ADMINISTRATION —THE FLORIDA EXPERIENCE § 93.1 (1968).

8. U.S. ARMY CORPS OF ENGINEERS, U.S. DEP'T OF DEFENSE, REPORT ON THE NATIONAL SHORELINE STUDY 17 (1971).

Erosion is stimulated by residential housing construction which destroys protective sand dunes, sea grass and scrub growth along barrier beaches.[9] Improved inlets also contribute to beach erosion by interrupting the littoral drift along the shore, piling up the sand on the updrift side and blocking it from the downdrift side.

Pollution from domestic, industrial and agricultural sources adversely affects the marine environment. Domestic pollution consists primarily of sewage and detergent wastes.[10] In addition to depleting the dissolved oxygen supply, domestic pollution may create a health hazard, destroying shellfish and other food sources as well as preventing swimming and other forms of recreation. Since domestic pollution is closely associated with urban development, the problem will become more serious as the urban population continues to increase.[11]

Industrial pollution includes discharges of heavy metals, inorganic chemicals and petroleum products.[12] Industrial pollution, already twice the volume of domestic wastes, is expected to increase sevenfold within a decade.[13]

Chlorinated hydrocarbons, such as DDT and other pesticides, are largely the result of agricultural operations. They enter the marine environment in water run-off and from the atmosphere.[14] Because the present levels of these substances pose no immediate threat, the short term impact of such pollutants may be negligible. However, there is evidence that the photosynthetic activity of marine organisms may be impaired by the long term effect of DDT and similar substances.[15]

In addition to the immediate consequences of dredge and fill operations, beach erosion and pollution, special consideration must be given to the long-term results of man's present use of the coastal zone resources. The prospect of a human and ecological disaster as the coastal and marine environment continues to deteriorate underscores the real problem of coastal zone administration. Unless

9. Teclaff & Teclaff, *Saving the Land-Water Edge from Recreation, for Recreation*, 14 ARIZ. L. REV. 39, 42 (1972).
10. Schachter & Serwer, *Marine Pollution Problems and Remedies*, 65 AM. J. INT. L. 84, 99 (1971).
11. Anderson, *Governmental Responsibility for Waste Management in Urban Regions*, 10 NAT. RES. J. 668, 669 (1970).
12. Schacter & Serwer, *supra* note 10, at 88.
13. Wenk, *The Physical Resources of the Ocean*, 221 SCIENTIFIC AMERICAN 167, 174 (Sept. 1969).
14. Schacter & Serwer, *supra* note 10, at 99.
15. B. COMMONER, THE CLOSING CIRCLE 226 (1971).

the problem is viewed from this perspective, policymakers will be unable to arrive at an effective solution.

B. The Causes of Coastal Environmental Problems

The immediate causes of many coastal environmental problems are easily determined. For example, dredge and fill operations harm plant and animal life in estuarine areas by outright physical displacement, by the destruction of food supplies and by increasing the turbidity of the water. Beach erosion is often caused by improperly located structures. Pollution from domestic, industrial or agricultural sources, or from the extraction of mineral resources from the seabed, destroys marine life in various ways.

Despite the efforts to curb the immediate causes of coastal environmental damage,[16] much of the harm to the coastal environment results from long range damage caused by past and present land-use patterns. The demand for residential housing near coastal areas is a continuing threat to remaining ecological resources. At the present time, approximately forty-five percent of the American population lives within fifty miles of one of the nation's coastlines. This population is heavily urbanized and is growing at a faster rate than the national average.[17] An estimated three-quarters of the American people will be concentrated near the coastal zone by the end of this century. As a result of this projected growth, the demand for commercial, residential and recreational sites will increase in coastal areas. Moreover, additional land for heavy industries requiring deep-port facilities and back-shore accesses will be needed.[18]

Because of this projected growth, the nation's coastal zone policy must be related to its land-use policy. Policymakers must address themselves to reversing a fundamental demographic trend or be willing to make intelligent tradeoffs between economic growth and environmental needs.

16. Many of the regulatory devices to be discussed in Part III are directed at these causes. Pollution control laws, for example, require the treatment of harmful substances before discharge into the air or water. Dredge and fill permit requirements restrict such operations in ecologically sensitive areas and attempt to minimize harm to living organisms. Site location regulations operate in much the same fashion, while coastal setback lines seek to control or prohibit the erection of structures in areas where they cause excessive damage to the environment.

17. *See* Schaefer, *Conservation of Biological Resources of the Coastal Zone*, COASTAL ZONE MANAGEMENT: MULTIPLE USE WITH CONSERVATION 39 (J. Brahtz ed. 1972). *See also* REPORT ON THE NATIONAL SHORELINE STUDY, *supra* note 8, at 4. Thirty coastal states, including the Great Lakes states, have seventy-five percent of the nation's population and twelve of the thirteen largest cities. *Id.*

18. COASTAL ZONE MANAGEMENT: MULTIPLE USE WITH CONSERVATION 11 (J. Brahtz ed. 1972).

C. *Solutions to the Environmental Problems of the Coastal Zone*

A solution to the problem of the coastal environment will initially evolve from a realistic conception of the problem and its causes. Once formulated, this concept must be followed by a wide range of regulatory devices, an administrative structure capable of effectively utilizing these enforcement tools, and finally, a developed and coherent public policy concerning the allocation of coastal zone resources.

In order to stabilize the relationship between the coastal environment and current land-use patterns, a variety of control devices are available for use in coastal areas. Shoreline zoning, taxation of real property and land acquisition programs can be used to influence national or statewide land-use patterns. Moreover, governmental actions with respect to highway construction, subdivision control, and the location of public transportation routes could be employed to affect demographic conditions instead of merely responding to them.

The creation of an effective administrative structure remains unrealized in most states, but the funding provided by recent federal legislation hopefully will overcome this inadequacy. The last requirement, the development of a comprehensive coastal zone management policy, will be discussed at length in Part V. Let it suffice at this point to say that such policymaking will involve the formulation of goals and priorities, as well as identifying the more desirable choice among competing values. Without such a policy, the government will fail to employ the resources at its disposal in a consistent or effective manner.

II. Property Rights in Coastal Areas

Public and private interests vary considerably within the three legally significant coastal zones: uplands, tidal and submerged lands. Governmental regulatory efforts are often affected by the complex nature of the property right problems associated with the demarcation of coastal boundaries. A consideration of the nature of property ownership in the various coastal areas is relevant to resolving the coastal zone administrative problems.

Private rights are dominant in the upland areas located above the high water line. In addition to the usual rights of ownership, owners of land bordering the shoreline often possess additional rights and liabilities with respect to accretion, reliction, erosion

and avulsion.[19]

The public interest is paramount in the submerged areas located below the low water line.[20] These lands are usually held by the state in trust for the public and cannot be conveyed into private ownership except under certain circumstances. According to the Submerged Lands Act,[21] the states own the beds of submerged lands within three miles of their coastline while the federal government holds title to submerged lands beyond this point.

A mixture of public and private interests prevail in the tidelines between the high and low water line. The tidelands are subject to private ownership in those states which recognize the low-water line as the seaward boundary.[22] However, in high-water states, such lands are held by the public in the same manner as submerged lands, with upland owners possessing limited rights to wharf or fill tidelands adjacent to their property.[23]

19. Accretion refers to the gradual deposit of material along the shoreline by the action of the water, while reliction refers to former submerged land uncovered by the imperceptible recession of the water. At common law, the riparian or littoral owner, rather than the owner of the bed, was entitled to all land created by accretion or reliction. *See generally*, F. MALONEY, S. PLAGER & F. BALDWIN, *supra* note 7, at § 126.

20. The United States Supreme Court, in United States v. California, 332 U.S. 19 (1947) and subsequent cases, has held that the federal government owns all submerged lands below the mean low water line. As a result of these decisions, Congress enacted the Submerged Lands Act, 43 U.S.C. §§ 1301-15 (1970), which granted to the states all offshore submerged lands within three miles seaward of their coasts. Gulf coast states were permitted to establish historical boundaries of up to three marine leagues. *See generally*, Lewis, *Capsule History and Present Status of the Tidelands Controversy*, 3 NAT. RES. LAW. 620 (1970). Recently, some of the states along the eastern seaboard that formed the original colonies have asserted claims to submerged lands beyond the three mile limit. *See* Flaherty, *Virginia and the Marginal Sea: An Example of History in the Law*, 58 VA. L. REV. 694 (1972).

21. 43 U.S.C. §§ 1301-15 (1970). The federal government administers submerged lands seaward of this boundary under the provisions of the Outer Continental Shelf Act, 43 U.S.C. §§ 1331-43 (1970).

22. The following states are presently regarded as low-waterline jurisdictions: Delaware, State *ex rel.* Buckson v. Pennsylvania R.R., 228 A.2d 587 (Del. Super. Ct. 1967); Georgia, GA. CONST. art. 1 § 6, GA. CODE ANN. § 85-1309 (1970); Maine, Sinford v. Watts, 123 Me. 230, 122 A. 573 (1923); New Hampshire, Nudd v. Hobbs, 17 N.H. 524 (1845); Pennsylvania, Wall v. Pittsburgh Harbor Co., 152 Pa. 427, 25 A. 647 (1893); and Virginia, Taylor v. Commonwealth, 102 Va. 759, 47 S.E. 875 (1904), VA. CODE ANN. § 62.1-2 (1968), *as amended* (Supp. 1972). In Massachusetts, according to the Colonial Ordinance of 1647, the low-water line is used if it does not extend more than one hundred rods (1650 feet) beyond the high-water line. *See* Michaelson v. Silver Beach Improvement Ass'n, Inc., 342 Mass. 251, 173 N.E.2d 273 (1961).

23. States currently considered to be high-waterline jurisdictions are as follows: Alabama, United States v. Turner, 175 F.2d 644 (5th Cir. 1949), *cert. denied*, 338 U.S. 851 (1949); City of Mobile v. Eslava, 9 Port. 577 (1839), *aff'd* 41 U.S. 234 (1842); Alaska, ALASKA STAT. § 38.05.320 (1962); California, Katenkamp v. Union Realty Co., 53 P.2d 390 (3d Dist. 1935), *rev'd on other grounds*, 6 Cal. 2d 765, 59 P.2d 473 (1936); People v. William Kent Estate Co., 242 Cal. App. 2d 156, 51 Cal. Rptr. 215 (1st Dist. 1966), CAL. CIV. CODE § 670 (West 1954); New Jersey, O'Neill v. State Highway Dept., 50 N.J. 307, 235 A.2d 1 (1967); New York, Tiffany v. Oyster Bay, 209 N.Y. 1, 102

In many jurisdictions, the public trust doctrine is an important legal concept which defines the nature of the state's proprietary rights in tideland and submerged areas and places restrictions on the alienation of such lands.[24] Although the public trust doctrine was received into America as part of the common law,[25] it appears to have a civil law origin as well.[26]

The ascertainment of coastal boundaries also complicates land-use control in coastal areas. The demarcation of coastal boundaries is a process that involves both legal and engineering aspects. From tidal observations, tidal datums are computed.[27] It must

N.E. 585 (1913); North Carolina, Carolina Beach Fishing Pier, Inc. v. Carolina Beach, 277 N.C. 297, 177 S.E.2d 513 (1970); Rhode Island, Jackvony v. Powel, 67 R.I. 218, 21 A.2d 554 (1941); Allen v. Allen, 19 R.I. 114, 32 A. 166 (1895); South Carolina, Cape Romain Land & Development Co. v. Georgia-Carolina Canning Co., 148 S.C. 428, 146 S.E. 434 (1928); and Washington, Wilson v. Howard, 5 Wash. App. 169, 486 P.2d 1172 (1971), Harkins v. Del Pozzi, 50 Wash. 2d 237, 310 P.2d 532 (1957).

Although Texas follows the high-water line standard where common law grants are concerned, Rudder v. Ponder, 156 Tex. 185, 293 S.W.2d 736 (1956), the line of higher high tide would be used in the case of Mexican or Spanish land grants. Luttes v. Texas, 159 Tex. 500, 324 S.W.2d 167 (1958). This tidal datum is the higher of the daily high tides at a particular locality over a nineteen year period. Where there are two high tides per day, the line of mean higher high tide will be above the line of mean high tide, but where there is only one high tide per day, the lines will be identical. *See generally*, Roberts, *The Luttes Case—Locating the Boundary of the Seashore*, 12 BAYLOR L. REV. 141 (1960).

Other jurisdictions have applied the mean high water line as the boundary in Spanish and common law grants. *See* San Francisco v. Le Roy, 138 U.S. 656 (1891); United States v. Pacheco, 69 U.S. (2 Wall.) 587 (1864); Apalachicola Land & Dev. Co. v. McRae, 86 Fla. 393, 98 So. 505 (1923); Brickell v. Trammell, 77 Fla. 544, 82 So. 221 (1919).

Louisiana, which follows the civil law, uses the line reached by the highest winter tide as the boundary (*see* 40 LA. CIV. CODE ANN. art. 451 (West 1952)), except in the case of a Spanish grant where the mean high water line is applied. New Orleans Land Co. v. Board of Levee Comm'r, 171 La. 718, 132 So. 121 (1930).

24. A thorough treatment of the public trust doctrine is outside the scope of this paper. Recent articles on the subject include Sax, *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471 (1970); Comment, *The Public Trust in Tidal Areas: A Sometime Submerged Traditional Doctrine*, 79 YALE L.J. 762 (1970); Note, *Conveyances of Sovereign Land Under the Public Trust Doctrine: When Are They in the Public Interest?* 24 U. FLA. L. REV. 285 (1972).

25. *See, e.g.*, Shively v. Bowlby, 152 U.S. 1 (1894); Illinois Central R.R. v. Illinois, 146 U.S. 387 (1892). The *Shively* decision held that the federal government owned title to the beds of navigable and tidal waters in its territories as trustee for the benefit of the inhabitants of the future states. The *Illinois Central* case declared that a state could not divest itself of its authority over the beds of navigable waters and thereby fail to regulate navigation on behalf of the people. In addition, the public trust doctrine has become part of the constitutional law of some states. *See* FLA. CONST. art. X § 11.

26. It has been suggested that the English common law adopted a principle of Roman law which recognized that while sovereignty of the government extended over the sea and seashore, their occupation belonged to all the Roman people generally, and rights over fishing and navigation were not subject to individual control. *See* Comment, *supra* note 24, at 763-64.

27. The simplest way to measure the tide is by reading the height of the water at regular intervals on a vertical staff fixed to some immobile object. However,

then be determined which of the tidal datums will be used to fix the boundary and finally these tidal datums must be related to the slope of the beach.[28]

The tide is the name given to the rise and fall of the level of the sea due to the influence of the sun and the moon on the rotating earth.[29] Variations in the respective influences of astronomical forces fall into a series of overlapping and recurring cycles which are reflected in the behavior of the tides. Thus, in addition to daily and semidaily forces which cause the tide to rise and fall, the tide also varies on a monthly and yearly basis.[30]

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it is generally more convenient to use an automatic tide gauge, a mechanical recording instrument that continuously traces on paper the height of the water at any instant.

The tide by definition is caused by astronomical forces, and therefore wind cannot produce a tide, although wind and barometric pressures can greatly affect the actual water level reached by a high or low tide. In addition, wind may cause horizontal movement by pushing water onto upland. However, the courts have rejected the notion that the wash of the waves upon the coast determines the height of the tide or that the high water mark is a physical mark on the ground by the water.

Generally, it is not necessary to observe the tide at a particular locality for 18.6 years in order to establish mean high or low tide. *See* note 30 *infra*. These datums can be ascertained by the secondary determination method. By shorter periods of observation at a particular locality, the readings can be correlated to the tide records of a primary gauge which has been in operation for at least 18.6 years at a nearby point. *See generally*, Comment, *Fluctuating Shorelines and Tidal Boundaries: An Unresolved Problem*, 6 U. SAN DIEGO L. REV. 447, 450 (1969).

28. H. MARMER, TIDAL DATUM PLANES, SPEC. PUB. No. 135 1, 2 (Rev. ed. 1952). *See also* Borax Consolidated, Ltd. v. Los Angeles, 296 U.S. 10 (1935); Humble Oil & Refining Co. v. Sun Oil Co., 190 F.2d 191 (5th Cir. 1951), *cert. denied*, 342 U.S. 920 (1952); Swartzwald v. Cooley, 39 Cal. App. 2d 306, 103 P.2d 580 (1940).

29. *See generally*, Miller v. Bay-to-Gulf, Inc., 141 Fla. 452, 193 So. 425 (1940). The monthly variations are due to the changes in the moon's phases, declination, and distance from the earth. The cycle relating to the phase of the moon produces its strongest astronomical force twice each month when the moon is new and full, and the tides occurring at those times are called "spring tides." The astronomical force produced by this cycle is weakest twice each month when the moon is in quadrapture, and the tides occurring then are called "neap tides."

The cycle relating to the moon's declination is strongest twice each month when the moon is at the tropics, and it is weakest when the moon is over the equator. The tides occurring at those times are called "tropic" and "equatorial" tides respectively.

The increase and decrease in the distance of the moon from the earth produces another cycle. The tides occurring when the moon is nearest the earth are called "perigean" tides and those occurring when the moon is farthest from the earth are called "apogean" tides.

All three of the cycles have different lengths and the relation of the cycles to each other is constantly changing. These cycles also differ in magnitude and their effect on the tide varies from place to place around the earth. Roberts, *supra* note 23, at 149.

30. The longest cycle to which the tide is subject is due to a slow change in the declination of the moon which covers 18.6 years. Hence daily observations of the tide for this period are necessary to include all astronomical variations of the tide in a particular locality. Roberts, *supra* note 23 at 150.

It is important to note that it is not the absolute height of the water which is in question, for it is not at all infrequent to have the low water of one day

In *Borax Consolidated, Ltd. v. Los Angeles*,[31] the United States Supreme Court used the mean high water line[32] to determine the seaward boundaries of upland areas granted to individuals by the federal government. Later, in *Hughes v. Washington*,[33] the federal rule was extended to grants made by the United States government prior to statehood. Language in that case suggested that the establishment of seaward boundaries in coastal areas was a federal question that should be determined by reference to federal law regardless of whether or not a federal grant was involved.[34] Nevertheless some states still do not recognize the high-water line as the seaward boundary but utilize the low-water line instead.[35]

There have been a few attempts to determine seaward boundaries by reference to phenomena other than tidal datums. For example, the state of Washington established a fixed line, the vegetation line as it existed in the year of statehood, as the seaward boundary.[36] Under this approach, littoral owners would not have

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higher than the high water of another day. Regardless of the height of the water, when the rise of the tide ceases and the fall is about to begin, the tide is at high water; when the fall of the tide ceases and the rise is about to begin, the tide is at low water. H. MARMER, *supra* note 28, at 1.

31. 296 U.S. 10 (1935).

32. At common law, ordinary high tide constituted the seaward boundary in coastal areas. There was, however, considerable confusion over which tides came within the meaning of "ordinary" and could thus be considered in ascertaining ordinary high tide. Lord Hale, in his treatise *De Jure Maris*, declared that only "neap tides which happen between the full and the change of the moon" should be used in such determinations. It was unclear, however, whether Hale meant daily tides or whether he was referring to true neap tides which occur twice a month at the first and third quarters of the moon. Both interpretations subsequently received judicial approval.

In Teschemacher v. Thompson, 18 Cal. 11 (1861), the California court defined ordinary high water as the mean of the neap tides and has adhered to this position in subsequent decisions. Similar language has appeared in Washington, Florida, and South Carolina cases. However in Attorney General v. Chambers, 4 DE G.M. & G. 206, 43 Eng. Rep. 486 (Ch. 1854), the English courts discarded this approach and defined ordinary high tide as a medium high tide between the spring and the neap tides.

In 1935, the United States Supreme Court, in the principle case of Borax Consolidated, Ltd. v. Los Angeles, 296 U.S. 10 (1935), modified the rule of the *Chambers* case and adopted the concept of mean high water as the federal test of the seaward boundary. Mean high water was defined as "the average height of all high waters at that place over a considerable period of time." *Id.* at 26-27. In announcing the new rule the Court relied upon the definition of mean high water employed by the U.S. Coast & Geodetic Survey (now known as the National Ocean Survey) which used the mean of all the high tides. The significance of the *Borax* decision is the equation of the legal standard of ordinary high tide with the scientific concept of mean high water, which provides a more precise means by which to establish seaward boundaries.

33. 389 U.S. 290 (1967).

34. *See* Teclaff, *supra* note 3, at 635-36.

35. *See* note 22 *supra.*

36. Hughes v. State, 67 Wash. 2d 799, 410 P.2d 20 (1966), *rev'd* 389 U.S. 290 (1967); Harkins v. Del Pozzi, 50 Wash. 2d 237, 310 P.2d 532 (1957); Shelton Logging Co. v. Gosser, 26 Wash. 126, 66 P. 151 (1901); Corker, *Where*

possessed rights to accretion and reliction.[37] The application of this rule was severely limited by the federal courts in *Hughes v. Washington*.[38] However, courts have sometimes utilized the vegetation line or even the meander line to determine the seaward boundaries in marshy areas where ascertainment is difficult.[39]

There are, in fact, five situations in which coastal boundaries cannot be determined by conventional methods. In each of these categories, those difficulties may have a substantial impact on the scope and effectiveness of the management program.

Coastal mangrove areas constitute the first of these. In such regions the vegetation obscures the high or low water mark. Where there is a berm near the outer edge of the mangroves, it may be continuous, or pierced by openings of greater or lesser magnitude, or it may taper off without fully enclosing the mangrove area. Since there are no cases directly on point, the legal significance of these differing physical characteristics remains uncertain.

There are different problems associated with coastal marshlands. Where boundaries cannot be ascertained on the ground by traditional leveling methods, aerial photography may often be used. This process, known as photogrammetry, involves the identification of vegetation by black-and-white, color, or infrared photography. The extent of the tidal effect can thus be determined by the nature and location of the vegetation photographed. However, since the accuracy of photogrammetric techniques varies according to the type of marshlands involved, the legal effect of this process of identification is still uncertain.

Areas with meandering tidally-affected drainage creeks present yet another problem. In such areas, the legal definition of navigability for title purposes will determine whether the coastal boundary line extends inland along the banks of these creeks or whether it should be projected across their mouths from headland to headland.

A fourth type of difficulty arises where a large drainage field meets the coast, with small hammocks scattered throughout a marshy area. Both the question of navigability and the accept-

Does the Beach Begin and to What Extent is this a Federal Question?, 42 WASH. L. REV. 33, 43-45 (1966).

37. Hughes v. State, 67 Wash. 2d 799, 813, 410 P.2d 20, 28 (1966), *rev'd* 389 U.S. 290 (1967).

38. 389 U.S. 290 (1967).

39. Trustees of Internal Improvement Fund v. Wetstone, 209 So. 2d 698 (2d Dist. Ct. App. 1968), *aff'd* 222 So. 2d 10 (Fla. 1969).

ability of photogrammetry for boundary location purposes are involved.

Finally, there is a problem with respect to brackish navigable streams flowing into the sea, bays and lagoons, where the range of the tide diminishes to the point where tidal effects can no longer be measured with sufficient accuracy. It must be determined whether boundaries shall be demarcated in such areas by reference to the mean high or low water line used in tidal waters, the ordinary high water mark used in fresh water, or the mean water-level line used for navigational purposes by the National Ocean Survey.

In some cases there is a substantial relationship between coastal boundaries and coastal management efforts. While constitutional limitations on the exercise of the police power restrict the extent to which the government can control the use of private property, no such constraints apply to the control of public property. Therefore, the nature of government regulation in a particular area may depend upon whether the lands involved are in public or private ownership. It is clear that many complex issues of property rights must be resolved if coastal resources are to be managed properly. This finding is supported by a provision of the recent federal Coastal Management Act which requires an identification of the boundaries of the coastal zone as part of approved state management programs.

III. COASTAL ZONE MANAGEMENT LEGISLATION

Over the years the decline of the coastal environment has induced a strong institutional response, primarily in the form of prohibitory or regulatory legislation. Commercial fishing has traditionally been licensed and controlled to protect marine resources. Federal legislation deals with the unlawful discharge of oil into the sea from wells, tankers and stationary sources.[40] Many species of marine or estuarine birds, mammals and reptiles are protected by state or federal law.[41]

In addition to these regulatory measures, there are a number of statutes dealing with generalized environmental problems that

40. Refuse Act, 33 U.S.C. § 407 (1970); Oil Pollution Control Act of 1961, 33 U.S.C. §§ 1001-15 (1970); Water Pollution Control Act, 33 U.S.C. § 1321 (Supp. 1973).

41. *See, e.g.*, 16 U.S.C. §§ 668aa to 668jj (Supp. 1973) (endangered species); 16 U.S.C. § 715 (Supp. 1973) (migratory birds); 16 U.S.C. §§ 1151-1187 (Supp. 1973) (seals & sea otters); 16 U.S.C. §§ 1361-1407 (Supp. 1973) (marine mammals).

are of significance to the coastal zone. As indicated earlier, both water and air pollution contribute to the impairment of the coastal environment.[42] The Federal Water Pollution Control Act[43] requires the treatment of industrial and domestic wastes and regulates the discharge of harmful substances into coastal as well as fresh waters. The water quality legislation of many coastal states encompasses coastal and marine waters.[44] The Federal Clean Air Act[45] provides for the establishment of standards to reduce emissions from motor vehicles. This same Act, along with state and local legislation, also seeks to control toxic emissions from stationary sources.

Finally, the National Environmental Policy Act of 1969[46] (NEPA) directs federal agencies to consider the environmental consequences of their operations. The provisions of the Act require agencies to file detailed environmental impact statements for all "major federal actions significantly affecting the quality of the human environment."[47] Although the parameters of this legislation have not yet been fully established, the federal courts to date have tended to give it a liberal interpretation. *Natural Resources Defense Council v. Morton*[48] has already demonstrated the relationship of NEPA to coastal ecology.

In addition to the measures discussed above, there are a significant number of regulatory devices which deal with the control of land-use in the coastal zone. These include shoreline zoning, coastal setback lines, site location regulations, wetland protection statutes, real property taxation, land acquisition and comprehensive management programs. Each of these devices is a response to one or more of the environmental problems reviewed earlier in this Article. Some of them, such as setback lines, site location regulations and dredge and fill controls, attempt to harmonize human land-use related activities in the coastal zone with ecological needs, or at least seek to minimize the harm of such activities. Other devices, such as density controls, land acquisition programs, and the use of tax incentives are designed to discourage development and preserve portions of the coastal zone in their natural state.

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42. *See* notes 10-15 *supra* and accompanying text.
43. 33 U.S.C. §§ 1251-1376 (Supp. 1973).
44. *See, e.g.*, CAL. WATER CODE § 13050(e) (1971); CONN. GEN. STAT. ANN. § 25-54b (Supp. 1973); DEL. CODE TIT. 7, § 6302 (Supp. 1970); FLA. STAT. ANN. § 403.031(3) (Supp. 1972); N.C. GEN. STAT. ANN. § 143-213(20) (Supp. 1971); VERNOR'S TEX. CODE ANN. WATER § 21.003(3) (1972).
45. 42 U.S.C. § 1857 (Supp. 1973).
46. 42 U.S.C. §§ 4321-4347 (Supp. 1973).
47. 42 U.S.C. § 4332(C) (Supp. 1973).
48. 458 F.2d 827 (D.C. Cir. 1972).

A. Federal Legislation

Before discussing specific regulatory measures, the latest federal legislation in the coastal zone administration should be reviewed. Recognizing the importance of the nation's coastal resources, Congress recently enacted the Coastal Zone Management Act of 1972.[49] This legislation seeks to encourage the development of comprehensive state management programs and the formulation of a national coastal zone policy. The significance of such a policy and the factors embodied in the policymaking process are the subject of Part V of this Article.

The Federal Act broadly defines the coastal zone as "coastal waters . . . and the adjacent shorelands . . . strongly influenced by each other . . . and includes transitional and intertidal areas, salt marshes, wetlands, and beaches."[50] The statute also authorizes grants to the states to develop and administer management programs, provides for coordination among federal agencies with interests in coastal areas, and provides for the creation of a Coastal Zone Management Committee.

Under the terms of the new legislation, the Secretary of Commerce may award annual grants to coastal states to assist them in developing coastal management programs. The development of these programs should include identification of the boundaries of the areas subject to regulation and delineation of permissible land and water uses for those areas in the state program. It should also include an inventory and designation of areas of critical concern. It should propose regulatory devices and the legal framework within which they will operate, as well as broad guidelines on the priority of uses within the coastal zone. Finally, it should describe the organizational structure under which the state program will operate. Upon final approval of its proposal by federal authorities, the state becomes eligible for administrative grants to finance the operation of its management program.

Another provision of the Federal Act requires coordination and cooperation among federal and state agencies on matters involving coastal areas. Such agencies are expected to conduct their operations in accordance with the dictates of the approved state management programs. In addition, federal licensees are normally required to obtain state certification that their activities will not conflict with the provisions and objectives of the state programs. Finally, the statute also authorizes the establishment of a

49. 16 U.S.C.A. §§ 1451-64 (1972).
50. 16 U.S.C.A. § 1453 (1972).

fifteen-member Coastal Zone Management Advisory Committee for the purpose of making recommendations to the Secretary on matters of policy concerning the coastal zone.

On the whole, the 1972 Coastal Zone Management Act is a positive step toward dealing with the problems of the coastal zone in an effective manner. In particular, the Act will hopefully provide a vehicle whereby public policy for the coastal zone may be developed and formalized.

B. Comprehensive State Programs

In most states responsibility for the coastal environment is fragmented among various state and local governmental units. Objectives and responses to coastal problems often vary considerably among these agencies with little communication or cooperation. Consequently, the overall regulatory effort is frequently haphazard and contradictory. A comprehensive coastal zone management program is superior to such piecemeal regulation because it concentrates responsibility in a single agency and provides for a more coordinated response to coastal problems.

Long-range planning is an essential aspect of comprehensive coastal zone management. By collecting and analyzing vast amounts of physical, economic, demographic and other data, planners are able to locate and evaluate coastal problems more effectively. This information will also provide increased knowledge about causal relationships between human activities and coastal phenomena. In addition, the collection of data will enable planners to construct models that can be used for predictive purposes. Finally, these studies will enable agency personnel to choose the most effective regulatory devices in order to accomplish the stated objectives of the program.

It is hoped that the Coastal Zone Management Act of 1972 will encourage the states to enact coastal zone legislation which will possess some of the characteristics described above. However, at the present time only three states have enacted such legislation. Washington and Rhode Island implemented their programs in 1971 and California followed shortly thereafter in 1972. The new Federal Act will no doubt encourage other states to develop comprehensive programs of their own. These programs usually involve substantial planning and coordinated developmental controls. The merit of the comprehensive management approach is that it concentrates on the interrelated nature of coastal resources and encourages the development of a coherent policy for the state's coastal area.

The Washington Shoreline Management Act[51] establishes a mechanism for managing the use of the shorelines of the state. The management program is implemented by the issuance of guidelines and standards by the state department of ecology, which local governments are to use in developing comprehensive use plans. In the formulation of such master programs, detailed studies and inventories are to be made of land uses and the potential environmental impact of various activities in coastal areas. In addition, master programs shall consider such factors as economic development, public access and recreational needs, transportation circulation patterns, the distribution of various activities in shoreline areas, and the preservation of natural areas and other areas of historical, cultural, scientific or educational significance.

The state agency may approve local programs unless they conflict with the Act's policy statement. Once the master programs are developed, they provide the basis for a locally administered permit system, regulating developments in excess of $1000 or which materially affect public use of the water or shoreline areas. Hearing procedures and judicial review are provided for as well as criminal and civil sanctions for violations of the Act.

In Rhode Island the Coastal Management Act controls most acitivities below the mean high water line.[52] In addition, the statute regulates such land-based activities as power generation or desalinization plants, chemical or petroleum processing, transfer or storage, mineral extraction, shoreline protection facilities and physiographical features, intertidal salt marshes, sewage treatment and solid waste disposal.

Regulation is accomplished by a permit system based upon a resource management plan. The program is administered by the Coastal Management Council, composed of representatives of the state legislature, members of the general public, and state and local governmental officials. In addition, advisory members may be appointed to the council from federal and regional agencies.

With the passage in November of 1972 of its Coastal Zone Conservation Act,[53] California implemented one of the most ambitious and comprehensive coastal management programs to date. The Act created a state coastal zone conservation commission and six regional commissions. The Act's declaration of policy stated:

51. WASH. REV. CODE § 90.58.010-.930 (Supp. 1972).
52. R.I. GEN. LAWS ANN. §§ 46-23-1 to -12 (Supp. 1972).
53. California Initiative Proposition No. 20 (1972), now CAL. PUB. RES. CODE §§ 27000-650 (West Supp. 1973).

> [T]he permanent protection of the remaining natural and scenic resources of the coastal zone is a paramount concern to present and future residents of the state and nation. . . . [I]t is the policy of the state to preserve, protect, and where possible, to restore the resources of the coastal zone for the enjoyment of the current and succeeding generations.[54]

In order to meet this commitment, the Act requires the state commission to prepare, with the assistance of the regional commissions, the California Coastal Zone Conservation Plan for submission to the Legislature in 1975. The Act also provides that the plan be consistent with the maintenance, restoration and enhancement of the overall quality of the coastal environment, and the continued existence of optimum populations of all species of living organisms. The plan must also promote the orderly utilization and preservation of all living and nonliving coastal resources, and the avoidance of irreversible and irretrievable commitments of coastal zone resources.

The Act further provides that the plan contain a precise definition of the public interest in the coastal zone, ecological planning principles, and assumptions to be used in determining the suitability and extent of allowable development. A component is also required in the plan that deals with land use, transportation, conservation, public access, recreation, location of public facilities and power plant sites, living marine and mineral resources, population densities, and educational or scientific uses of the coastal zone.

A "permit area" is established by the Act one thousand yards inward from the mean tide line. Within this area development activities are to be controlled by means of a permit system until the Coastal Zone Conservation Plan is implemented. This permit system is to be administered primarily by the regional commissions. The Act declares that no permits are to be issued unless the regional commission finds that the proposed activity will not have any adverse environmental or ecological effect and that it will be consistent with the findings and declarations set forth in various sections of the act.

C. Zoning and Related Land-Use Control Devices

Traditional land-use control measures such as zoning may be utilized at the state or local level for land management purposes in coastal areas. At the present time none of the states have implemented a system of statewide shoreline zoning. However,

54. CAL. PUB. RES. CODE § 27001 (West Supp. 1973).

Wisconsin,[55] Minnesota[56] and Michigan[57] have employed this device to protect fresh-water lakes. Both Wisconsin and Minnesota require the zoning of all lands in unincorporated areas within a prescribed distance of lakes and streams. Under the Michigan statute, zoning is confined to areas that are vulnerable to shore erosion or are ecologically valuable.

The Hawaii State Land Use Program[58] provides a useful model of how a statewide system of shoreline zoning might operate. Under the Hawaii act, a statewide land-use policy is administered by a nine-member State Land Use Commission, which includes seven members appointed by the governor, in addition to the Director of Planning and Economic Development and the Director of Land and Natural Resources who serve as ex-officio members. After public hearings, the commission is authorized to divide the state into various land-use districts. There are presently four categories: urban, agricultural, conservation and rural. Counties and municipalities are permitted to zone so long as the zoning is compatible with the state land-use program. The Department of Natural Resources regulates land-use directly in the conservation districts, which currently include about forty-five percent of the state's land area. Departures from authorized use patterns are allowed by special permit with the approval of both the State Land Use Commission and the local authorities (or Department of Natural Resources, where appropriate).

In addition to shoreline zoning, land use may be regulated through the use of special permit requirements. These devices have been used primarily to control activities which lead to beach erosion. Several states now have established coastal setback lines below which no construction may take place without obtaining a permit from the local authorities.[59] Removal of material from the shore has also been regulated in some instances,[60] and special provisions have been enacted for the protection of sand dunes in order to prevent the erosion so often associated with their destruction.[61]

55. WIS. STAT. ANN. § 59.971 (Supp. 1973).
56. MINN. STAT. ANN. § 105.485 (Supp. 1973).
57. MICH. CORP. LAWS ANN. §§ 281.631-.642 (Supp. 1972).
58. HAWAII REV. STAT. §§ 205-1 to -15 (1968) *as amended* (Supp. 1972). For a general discussion of the techniques employed see E. BRADLEY & J. ARMSTRONG, A DESCRIPTION AND ANALYSIS OF COASTAL ZONE AND SHORELINE MANAGEMENT PROGRAMS IN THE UNITED STATES 215-17 (Sea Grant Tech. Rep. No. 20, U. Mich. 1972).
59. *See, e.g.*, FLA. STAT. ANN. § 161.053 (1972); HAWAII REV. STAT. §§ 205-32, -34 (Supp. 1972).
60. *See, e.g.*, MISS. CODE ANN. § 49-15-9 (1973); ORE. REV. STAT. § 780.040 (1971).
61. N.C. GEN. STAT. § 104B-4 (1972); Note, *Environmental Law—The Public*

The location of electric power plants and large scale industrial plants may be made subject to special permit requirements, preferably at the state level. Under the provisions of the Maine Site Location Act,[62] a permit from the state environmental improvement commission is required for the construction of commercial or industrial developments which are subject to regulation under air and water pollution control statutes. A commission permit is also required of projects covering more than twenty acres of land, involving the excavation of natural resources (unless otherwise regulated), or involving structures of more than 60,000 square feet on a single parcel of land.

In like manner, the Delaware Coastal Zone Act[63] prohibits the further introduction of heavy industry in coastal areas, while manufacturing operations other than heavy industry are regulated by permit. Requests for new manufacturing uses or expansions of existing non-conforming uses are sent to the state planner. A hearing is held and if it is found that the use requested is otherwise allowable, it must then be considered in light of environmental impact, economic effect, aesthetic effect, effect of neighboring land uses, and effect on local developmental plans.

In addition to the Maine and Delaware Acts, there are numerous state statutes concerned with the location of power plants.[64] Such legislation is significant since the need for large amounts of water for cooling purposes has led to the location of nuclear and large fossil fuel power plants in coastal areas, often resulting in thermal and air pollution hazards.[65]

D. Wetlands Protection

Wetlands are particularly vulnerable to injury from developmental activities, and therefore need special protection. Many state legislatures have become aware of this and have enacted laws directed at controlling development within these areas.[66]

Trust Doctrine: A Useful Tool in the Preservation of Sand Dunes, 49 N.C.L. REV. 973 (1971).

62. ME. REV. STAT. ANN. tit. 38, §§ 481-488 (Supp. 1972-73).

63. DEL. CODE ANN. tit. 7, §§ 7001-7013 (Supp. 1972). *See also* Note, *Legislation—The Delaware Coastal Zone Act*, 21 BUFF. L. REV. 481 (1972).

64. *See, e.g.*, MD. CODE ANN. art. 66C §§ 766-771 (Supp. 1972); WASH. REV. CODE ANN. §§ 80:50.010-.900 (Supp. 1972).

65. *See generally* Smith, *Electricity and the Environment—The Generating Plant Siting Problem*, 26 BUS. LAW 169 (1970); Willrich, *The Energy-Environment Conflict: Siting Electric Power Facilities*, 58 VA. L. REV. 257 (1972); Symposium, *The Location of Electricity-Generating Facilities*, 47 WASH. L. REV. 1 (1971).

66. California has imposed developmental controls in the San Francisco Bay Area. *See* CAL. GOV'T CODE §§ 66600-610 (West Supp. 1972). Vermont specifically regulates dredge and fill operations in fresh water wetlands. VT. STAT.

Under most of these statutes a declaration of policy sets forth the importance of estuarine areas to such public interests as fish and wildlife conservation, recreation and commercial fisheries.[67] Wetlands or estuarine areas are usually defined as being subject to tidal influence,[68] or located above a certain tidal elevation.[69] Frequently areas are deemed to be estuarine if designated flora such as saltmarsh grass, blackgrass, or salt-meadow grass are found there.[70] States with estuarial areas are increasingly creating agencies empowered to promulgate rules and enforce regulating provisions,[71] and frequently criminal penalties are imposed for violating these provisions.[72]

In almost all cases, landowners are required to obtain a permit before commencing developmental activities in regulated areas.[73]

ANN. tit. 10, §§ 1-1100-05 (Supp. 1972). *See also* CONN. GEN. STAT. §§ 22a-28 to 45 (Supp. 1973); GA. CODE ANN. §§ 45-136 to 147 (Supp. 1972); ME. REV. STAT. ANN. tit. 12, §§ 4701-4709 (Supp. 1972-73); MD. ANN. CODE art. 66c, §§ 718-730 (1970), *as amended* (Supp. 1972); MASS. GEN. LAWS ANN. ch. 130, § 105 (Supp. 1973); N.H. REV. STAT. ANN. §§ 483-A:1 to 4 (Supp. 1972); N.J. STAT. ANN. §§ 13:9A-1 to A-10 (Supp. 1972-73); N.Y. ENVIRON. CONSERV. LAW § 15-0317 (McKinney 1972); N.C. GEN. STAT. § 113.229 (Supp. 1971); R.I. GEN. LAWS ANN. § 11-46.1-1 (Supp. 1972); VA. CODE ANN. §§ 62.1-13.1 to 13.20 (Supp. 1972).

67. CONN. GEN. STAT. ANN. § 22a-28 (Supp. 1973); MD. ANN. CODE art. 66c, § 718 (1970); N.H. REV. STAT. ANN. § 483-A:1-b (Supp. 1972); N.J. STAT. ANN. § 13:9A-1 (Supp. 1972); R.I. GEN. LAWS ANN. § 11-46.1-1 (Supp. 1972).

68. CONN. GEN. STAT. ANN. 22a-29(2) (Supp. 1973); GA. CODE ANN. § 45-137(a), (b) (Supp. 1972); ME. REV. STAT. ANN., tit. 12 § 4701 (Supp. 1972-73); MASS. GEN. LAWS ANN. ch. 130, § 105 (Supp. 1973); N.H. REV. STAT. ANN. § 483-A:1-a (Supp. 1972); N.J. STAT. ANN. § 13:9A-2 (Supp. 1972); N.C. GEN. STAT. § 113-229(n)(3) (Supp. 1971).

69. CONN. GEN. STAT. ANN. § 22a-29(2) (Supp. 1973); N.H. REV. STAT. ANN. § 483-A:1-a (Supp. 1972); N.J. STAT. ANN. § 13:9A-2 (Supp. 1972).

70. CONN. GEN. STAT. ANN. § 22a-29(2) (Supp. 1973); GA. CODE ANN. § 45-137(a) (Supp. 1972); N.H. REV. STAT. ANN. § 483-A:1-a (Supp. 1972); N.J. STAT. ANN. § 13:9A-2 (Supp. 1972-73); N.C. GEN. STAT. § 113-229(n)(3) (Supp. 1971); R.I. GEN. LAWS ANN. § 11-46.1-1 (Supp. 1972).

71. CONN. GEN. STAT. ANN. § 22-6 (Supp. 1973) (Commissioner of Agriculture); GA. CODE ANN. § 45-138 (Supp. 1972) (Coastal Marshlands Protection Agency); ME. REV. STAT. ANN. tit. 12, § 4705 (Supp. 1972-73) (Wetlands Control Board); MASS. GEN. LAWS ANN. ch. 130, § 105 (Supp. 1973) (Commissioner of Natural Resources); N.H. REV. STAT. ANN. § 483-A:3 (Supp. 1972) (Water Resources Board); N.J. STAT. ANN. § 13:9A-2 (Supp. 1972-73) (Commissioner of Environmental Protection); N.Y. ENVIRON. CONSERV. LAW § 15-0317 (McKinney 1972) (Water Resources Commission); N.C. GEN. STAT. § 113-230 (Supp. 1971) (Department of Conservation & Development); R.I. GEN. LAWS ANN. § 11-461-1 (Supp. 1972) (Department of Natural Resources).

72. CONN. GEN. STAT. ANN. § 22a-35 (Supp. 1973); GA. CODE ANN. § 45-145 (Supp. 1972); ME. REV. STAT. ANN. tit. 12, § 4709 (Supp. 1972-73); MD. ANN. CODE art. 66c, § 730 (1970); N.J. STAT. ANN. § 13:A-9 (Supp. 1972-73); N.Y. ENVIRON. CONSERV. LAW 71-1107 (McKinney 1972); N.C. GEN. STAT. § 113-229(k) (Supp. 1971); R.I. GEN. LAWS ANN. § 11-46.1-1 (Supp. 1972).

73. CONN. GEN. STAT. ANN. § 22a-32 (Supp. 1973); GA. CODE ANN. § 45-140 (a) (Supp. 1972); ME. REV. STAT. ANN. tit. 12 § 4701 (Supp. 1972-73); N.H. REV. STAT. ANN. § 483-A:1 (Supp. 1972); N.J. STAT. ANN. § 13:9A-4 (Supp. 1972-73); N.Y. ENVIRON. CONSERV. LAW § 15-0505 (McKinney 1972); N.C. GEN. STAT. § 113-229(a) (Supp. 1971); R.I. GEN. LAWS ANN. § 11-46:1-1 (Supp. 1972).

Often the applicant must supply sufficient information regarding the proposed operation so the agency can evaluate its ecological impact.[74] Permits are granted or denied after a hearing before the state agency[75] or local authorities.[76] In the latter case, the state agency typically must approve all permits issued by local officials.[77] Permits may be issued subject to conditions or restrictions designed to accomplish the objectives of the act.[78] Administrative[79] or judicial review is usually provided.[80] Sometimes the state is given the option of condemning a fee simple or lesser interest in the property when the court determines that the restrictions imposed on the landowner amount to a taking of property without due process of law.[81]

Unlike those of other states, the Maryland wetlands protection statute[82] distinguishes between state and private wetlands and sets forth the nature and extent of riparian rights in each category. State wetlands are located under navigable waters, below mean high tide, and are affected by the rise and fall of the tide. However, private wetlands are not necessarily located under navigable waters, nor are they always below mean high tide. They need only border tidal waters, be subject to some tidal influence and support aquatic growth. Although subject to general regulation, dredge and fill operations are usually permitted in private wetlands. State wetlands are more strictly controlled.

E. Taxation Policies

Tax laws, particularly those relating to the levy and assessment of real property taxes, can be used as a land management device

74. CONN. GEN. STAT. ANN. § 22a-32 (Supp. 1973); GA. CODE ANN. § 45-140 (b) (Supp. 1972); ME. REV. STAT. ANN. tit. 12, § 4701 (Supp. 1972-73); N.H. REV. STAT. ANN. § 483-A:1 (Supp. 1972); N.J. STAT. ANN. § 13:9A-4(c) (Supp. 1972-73); N.Y. ENVIRON. CONSERV. LAW § 15-0505(2) (McKinney 1972); N.C. GEN. STAT. § 113-229(b) (Supp. 1971).

75. CONN. GEN. STAT. ANN. § 22a-32 (Supp. 1973); MD. ANN. CODE art. 66c, § 726 (Supp. 1972); N.H. REV. STAT. ANN. § 483-A:2 (Supp. 1972).

76. ME. REV. STAT. ANN. tit. 12, § 4701 (Supp. 1972-73).

77. ME. REV. STAT. ANN. tit. 12 § 4702 (Supp. 1972-73).

78. CONN. GEN. STAT. ANN. § 22a-33 (Supp. 1973); GA. CODE ANN. § 45-140(f) (Supp. 1972); ME. REV. STAT. ANN. tit. 12: 3702 (Supp. 1972-73); MD. ANN. CODE art. 66c, § 727 (1970); N.J. STAT. ANN. § 13:9A-4(d) (Supp. 1972-73); N.Y. ENVIRON. CONSERV. LAW § 15-0505(4) (McKinney 1972); N.C. GEN. STAT. § 113-229(e) (Supp. 1971).

79. GA. CODE ANN. § 45-140(j) (Supp. 1972); MD. ANN. CODE art. 66c § 728 (1970); N.C. GEN. STAT. § 113-229(f) (Supp. 1971).

80. CONN. GEN. STAT. ANN. § 22a-34 (Supp. 1973); ME. REV. STAT. ANN. tit. 12 § 4704 (Supp. 1972-73); MASS. GEN. LAWS ANN. ch. 130, § 105 (Supp. 1973); N.H. REV. STAT. ANN. § 483-A:4 (Supp. 1972); N.J. STAT. ANN. § 13:9A-6 (Supp. 1972-73); N.C. GEN. STAT. § 113-229(f) (Supp. 1971).

81. CONN. GEN. STAT. ANN. § 22a-34 (Supp. 1973); MASS. GEN. LAWS ANN. ch. 130, § 105 (Supp. 1973); N.H. REV. STAT. ANN. § 483-A:4 (Supp. 1972).

82. MD. ANN. CODE art. 66c, § 718 (1970). *See also* Comment, *Maryland's Wetlands: The Legal Quagmire*, 30 MD. L. REV. 240 (1970).

in regulating development. Assessment of land at existing use, rather than highest and best use, would encourage landowners to devote their property to nonintensive uses.[83] If a proposed management program contemplates restrictions on development for substantial portions of coastal property, it is important that the state's tax policies support this objective.

Again, Hawaii provides a good example of how this may be accomplished. One of the objectives of Hawaii's land-use law is to promote more efficient land-use patterns. Accordingly, Hawaii established a special category of land use known as "dedicated lands" to allow landowners[84] within agricultural or conservation districts the benefit of lower tax assessments if they agree to dedicate their property to ranching or agriculture uses. If the dedication request is approved by the state authorities, the landowner agrees to restrict the use of his land for a minimum period of ten years during which time the land will be assessed at its value for that use rather than its actual market value. Failure to abide by the terms of the agreement will subject the property owner to higher assessments in addition to a five percent per annum penalty.

The Hawaii approach, though not without its flaws,[85] appears to be a relatively effective means of bolstering the regulatory aspects of a land management program. In particular, the concept of dedication seems to have considerable potential for a proposed coastal zone management program.

F. Land Acquisition

The federal government presently owns about 45,300 miles, or fifty-four percent of the nation's shoreline. However, 41,400 miles of this is located in Alaska. State and local governments own another 10,100 miles, or twelve percent, and 26,300 miles of shoreline is in private ownership. The title to another 2,600 miles is uncertain.[86] A far greater portion of upland area is privately owned. Since there are constitutional limitations on the power of the state to control development by means of its police power, it follows that the power to acquire land by purchase or

83. *See* D. HAGMAN, URBAN PLANNING AND DEVELOPMENT CONTROL LAW § 192 (1971); Hagman, *Open Space Planning and Property Taxation—Some Suggestions*, 1964 WIS. L. REV. 628. *See also* CAL. GOV'T CODE §§ 51200-51295 (1966) *as amended* (West Supp. 1972); HAWAII REV. STAT. § 205-14 (1968).

84. Seventy-five percent of the privately owned land in Hawaii is in the hands of only fifty landowners. Consequently, most of the land is leased. *See* E. BRADLEY & J. ARMSTRONG, *supra* note 58, at 221.

85. *See id.* at 229-35.

86. U.S. DEP'T OF DEFENSE, ARMY CORPS OF ENGINEERS, U.S. REPORT ON THE NATIONAL SHORELINE STUDY 30 (1971).

by eminent domain is essential to an effective coastal zone management program.[87]

Several states, notably New Jersey,[88] have already undertaken large-scale land acquisition programs in coastal areas. However, since outright acquisition is very expensive, it should not be employed indiscriminately. Comprehensive planning would reveal those areas in which aesthetic, ecological or recreational values are high and acquisition efforts should be concentrated there.

Costs can be reduced by the acquisition of developmental rights or conservation easements instead of fee simple estates.[89] In some cases, interim developmental controls may be used to "freeze" land-use patterns for short periods of time, thus permitting future acquisition at lower cost.[90] Finally, subdivision controls may also provide for the dedication of coastal land or developmental rights.[91]

However, uncertainty about the location of coastal boundaries and the nature of property rights in coastal areas has led some states to assert a proprietary interest in such areas as a means of preserving the ecology of the coastal zone and discouraging development by private owners.[92] Recent New Jersey legislation, for example, has attempted to shift the burden of establishing ownership from the state to the record owners by authorizing the issuance of maps which set forth the government's claims to a substantial portion of the state's tidal marshes.[93] According to one commentator:

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87. For a discussion of the relation between regulation under the police power and acquisition by eminent domain with respect to the preservation of open space areas, see A. DUNHAM, PRESERVATION OF OPEN SPACE AREAS (1966); Evelet, *An Appraisal of Techniques to Preserve Open Space*, 9 VILL. L. REV. 559 (1964).

88. N.J. STAT. ANN. §§ 13:8A-1 to 34 (1968) *as amended* (Supp. 1972-73). *See also* Heath, *Descriptions of Illustrative State Programs of Estuarine Conservation*, in J. HITE & J. STEPP, COASTAL ZONE RESOURCE MANAGEMENT 157 (1971).

89. *See* Eckert, *Acquisition of Development Rights: A Modern Land Use Tool*, 23 U. MIAMI L. REV. 347 (1969).

90. For a discussion of interim land use controls see Freilich, *Interim Development Controls: Essential Tools for Implementing Flexible Planning and Zoning*, 49 URBAN L.J. 65 (1971).

91. There are constitutional limits to the nature and value of subdivision exactions. The leading case is Pioneer Trust & Sav. Bank v. Village of Mount Prospect, 22 Ill. 2d 375, 176 N.E.2d 799 (1961). *See also* Heyman & Gilhool, *The Constitutionality of Imposing Increased Community Costs on New Suburban Residents Through Subdivision Exactions*, 73 YALE L.J. 1119 (1964).

92. An example of this is the implied dedication theory by which the owners of beach areas are forced to permit public access. *See* Gion v. Santa Cruz, 2 Cal. 3d 29, 465 P.2d 50, 84 Cal. Rptr. 162 (1970); State *ex rel.* Thornton v. Hay, 254 Ore. 584, 462 P.2d 671 (1969); Seaway Co. v. Attorney General, 375 S.W.2d 923 (Tex. Civ. App. 1964); Note, *Public Access to Beaches*, 22 STAN. L. REV. 564 (1970).

93. N.J. STAT. ANN. § 13:1B-13.4 (Supp. 1972-73).

> [H]undreds of properties in New Jersey have been taken and used for state purposes without compensating the record owners or lien holders; prior homeowners of many years are being threatened with loss of title; prior grants and state deeds are being ignored; properties are being arbitrarily claimed and conveyed by the State to persons other than the record owners; and hundreds of cases remain pending and untried before the state courts or are awaiting processing with the Natural Resource Council.[94]

Presently, a backlog of such cases are still awaiting trial despite the enactment of legislation authorizing the addition of six new judges to handle these matters.[95]

The New Jersey experience suggests that a policy of this sort may raise more problems than it solves. A case-by-case determination of title to large amounts of coastal property will frequently involve substantial costs to both the government and the record title owners. Extensive proofs will be required in many instances, including comprehensive map displays, extensive soil analysis, topographical data, historical and tidal data and expert testimony.[96]

Moreover, this approach does not necessarily promote rational land use. Even where the seaward boundary can be accurately determined, many record title owners may raise such defenses as estoppel by deed and equitable estoppel where the property was erroneously conveyed by the state into private ownership. Consequently, some land owners may escape the intended developmental restrictions.

Finally, it seems inequitable to allow the state to repudiate its own conveyances and upset longstanding titles. The social and economic consequences of such a policy militates against its use where other alternatives are available to control coastal development.

IV. Constitutional Limitations on Public Regulation

Governmental measures to protect the coastal environment are subject to a number of institutional and practical constraints. The inadequacies of state administrative resources and the political opposition of land developers and commercial interests may impose limits on the scope of coastal management efforts. Moreover, state agencies must often share power with local govern-

94. Porro & Teleky, *Marshland Title Dilemma: A Tidal Phenomenon*, 3 Seton Hall. L. Rev. 323, 325-26 (1972) (footnotes omitted).
95. N.J. Stat. Ann. § 2A:2-1 (Supp. 1972-73).
96. Porro & Teleky, *supra* note 94, at 331.

ments when it comes to controlling land use. Where state and local interests fail to agree, compromise by state officials sometimes becomes necessary.

In addition to these limitations, the due process clauses of the federal and state constitutions impose restrictions on state regulatory powers. The scope of the police power is confined by the test of reasonableness, which examines the validity of particular regulations in light of the attendant factual circumstances. In deciding the reasonableness issue, the courts inquire into whether the application of the regulation is arbitrary because it is not reasonably related to the permissible objectives, is discriminatory because it does not treat similarly situated property owners alike, or is confiscatory because it prevents any profitable use of the land.[97]

In the case of highly restrictive use classifications such as primitive and limited recreational areas, much of the land placed within such districts might have to be acquired by the government because of substantive due process considerations. It should be mentioned, however, that the experience with flood plain zoning and agricultural zoning indicates that extensive developmental restrictions may be tolerated in many situations.[98]

To date, the courts of Massachusetts, Connecticut, Maine and California have considered the constitutional validity of state developmental controls in the coastal zone.[99] However, only one of these courts has unequivocably upheld the use of such restrictions as a proper exercise of the police power. *Commissioner of Natural Resources v. S. Volpe & Co.*[100] was one of the first cases to deal with this issue.[101] The case arose when the owner of a tidal marsh began filling operations without obtaining the required permit and the state officials sought injunctive relief. The trial court found that the marsh was necessary for the preservation of marine fisheries and that the fill restriction was legislatively au-

97. Note, *Protection of Environmental Quality in Non-metropolitan Regions by Limiting Development*, 57 IOWA L. REV. 126, 134-35 (1971).

98. *See* Mang v. County of Santa Barbara, 182 Cal. App. 2d 93, 5 Cal. Rptr. 724 (2d Dist. 1960); Vartelas v. Water Resources Comm'n, 146 Conn. 650, 152 A.2d 822 (1959). *See also* Dunham, *Flood Control Via the Police Power*, 107 U. PA. L. REV. 1098 (1959); Note, *Flood Plain Zone for Flood Loss Control*, 50 IOWA L. REV. 552 (1965).

99. For a more detailed discussion of constitutionality of state wetlands protection legislation, see Ausness, *A Survey of State Regulation of Dredge and Fill Operations in Nonnavigable Waters*, 8 LAND & WATER L. REV. 65, 72-89 (1973).

100. 349 Mass. 104, 206 N.E.2d 666 (1965).

101. *See* Heath, *Estuarine Conservation Legislation in the States*, 5 LAND & WATER L. REV. 351, 360-62 (1970); Rychman, *Eminent Domain—Conservation-Evidence Necessary to Determine if a Regulation Restricting the Use of Property is Invalid as a Taking Without Compensation*, 6 NAT. RES. J. 8 (1966).

thorized. It held the legislation to be a valid exercise of the state police power. The resulting imposition upon the landowner did not constitute the taking of property without just compensation.

The opinion of the Massachusetts Supreme Court relied on two zoning cases, *Morris County Improvement Co. v. Township of Parsippany-Troy Hills*[102] and *Dooley v. Town Plan and Zoning Commission*[103] to distinguish permissible regulation from an unconstitutional taking.

In the *Morris County* case, the New Jersey court invalidated a zoning ordinance which restricted development in a marsh which served as a wildlife refuge and flood water detention area. The provisions, which effectively prevented the landowner from making any beneficial use of the land, were deemed "constitutionally unreasonable and confiscatory."[104] In *Dooley*, a zoning ordinance established a flood plain zone along a tidal stream and prohibited fill operations within the area. The uses permitted by the ordinance were impractical and the owner showed that the market value of his property would be reduced seventy-five percent as a consequence of the restrictions imposed upon it. Accordingly, the Connecticut court declared the ordinance invalid.[105]

As a test of the general validity of developmental controls within the coastal zone, the *Volpe* case must be regarded as inconclusive. However, its significance lies in the court's reliance upon zoning principles for determining the reasonableness of land-use restrictions in coastal areas.

Another Massachusetts case, *MacGibbon v. Board of Appeals of Duxbury*,[106] involved the denial of a special use permit required under a zoning ordinance before an owner could fill a portion of his shorefront property. The court remanded the case to the zoning board without reaching the issue of uncompensated taking. However, it reasoned that preservation of privately owned land in its natural unspoiled state for the enjoyment and benefit of the public, through prevention of any other practical use by the owner, was not within the authority delegated to municipalities under the state zoning enabling act.

By way of dictum, however, the court suggested several lawful ways in which the town could preserve its remaining wetlands

102. 40 N.J. 539, 193 A.2d 232 (1963).
103. 151 Conn. 304, 197 A.2d 770 (1964).
104. 40 N.J. at 557, 193 A.2d at 242.
105. 151 Conn. at 304, 197 A.2d at 770.
106. 356 Mass. 635, 255 N.E.2d 347 (1970).

such as by eminent domain acquisition. However, the inference to be drawn was that land use restrictions would be invalid due to a lack of an adequate statutory basis.[107]

Shortly after the *MacGibbon* case, however, the Massachusetts court in *Golden v. Board of Selectmen of Falmouth*[108] upheld the denial of a special permit under the 1963 wetlands protection statute. Local officials denied a permit to dredge a channel through a tidal marsh although state officials had approved the proposal. The case turned on whether the wetlands protection act allowed local officials to deny permits which the state agency had approved.

The court determined that the state zoning enabling legislation conferred the power upon municipalities to regulate the use of wetlands independently of the provisions of the state act and concluded that a local board had the power to deny a permit as long as its decision was not "based on a legally untenable ground" or was not "unreasonable, whimsical, capricious or arbitrary."[109] Although the intent of the ordinance was similar to that of the *Volpe* and *MacGibbon* cases, the court did not explicitly deal with the substantive due process issue.

In *State v. Johnson*,[110] the Maine wetlands protection statute was declared invalid as it applied to the plaintiffs' property. The landowners' fill permit application was denied by the state board because the proposed operation would threaten public health, and damage wildlife and estuarial areas.[111] When the landowners challenged the validity of the act in a prior proceeding,[112] the court remanded the case for further findings of fact. Meanwhile, the landowners continued their filling operation, forcing the state agency to seek and obtain an injunction.

On appeal the landowners argued that the imposition of the regulation and the injunction were confiscatory in nature. The court stated that while the government could regulate the use of property in a reasonable manner, the magnitude of the decrease in value might at times be sufficient to compel the government to utilize its power of eminent domain. The preservation of tidal wetlands was regarded by the court as a matter of statewide rather

107. *See* Comment, *Maryland's Wetlands: The Legal Quagmire*, 30 MD. L. REV. 240, 258 n.117 (1970).
108. 358 Mass. 506, 265 N.E.2d 573 (1970).
109. *Id.* at 509, 265 N.E.2d at 576, *quoting from* MacGibbon v. Board of Appeals of Duxbury, 356 Mass. at 639, 255 N.E.2d at 350.
110. 265 A.2d 711 (Me. 1970).
111. *Id.* at 713.
112. Johnson v. Maine Wetlands Control Bd., 250 A.2d 825 (Me. 1969).

than local concern, and since the benefits from the preservation of wetlands extended beyond the municipal limits, the immediate benefit to the individual landowner was minimal in comparison with the inconvenience imposed upon him. Therefore, the court reasoned the landowners' "compensation by sharing in the benefits which this restriction is intended to secure is so disproportionate to their deprivation of reasonable use that such exercise of the State's police power is unreasonable."[113]

More recently, a similar zoning ordinance in Connecticut was held invalid. In *Bartlett v. Zoning Commission of the Town of Old Lyme*,[114] the Connecticut court, relying on the *Dooley* case, held that the municipal zoning regulation enacted to control development in tidal marshlands was so restrictive as to amount to a violation of due process. The ordinance allowed such uses as wharves, duck blinds and public boat landings, but prohibited any filling operation or major improvement, thereby rendering the property virtually useless and unprofitable.

A California court upheld the validity of developmental controls over San Francisco Bay in *Candlestick Properties, Inc. v. San Francisco Bay Conservation and Development Commission.*[115] When a landowner's application for a permit to deposit fill from construction projects was denied by the commission, he filed an action for mandamus, or in the alternative, damages for an alleged taking of his property. The court denied relief, declaring that it would not impose any limitations upon an exercise of the police power "save that it not be unreasonably and arbitrarily invoked and applied."[116]

The court indicated that the legislation must be sustained if there was any reasonable basis to support the legislative determination of the regulation's wisdom and necessity. It was determined that recitals in the act's declaration of policy provided such a basis.[117] The court also invoked the "fairly debatable" test of zoning law to sustain the agency's action. Distinguishing the *Morris County* and *Dooley* cases, the court in *Candlestick* summarily concluded that the regulation did not unduly restrict the plaintiff's use of his property despite the fact that the agency

113. 265 A.2d at 716.
114. 161 Conn. 24, 282 A.2d 907 (1971).
115. 11 Cal. App. 3d 557, 89 Cal. Rptr. 897 (1st Dist. 1970); *see* Note, *Coastal Zone Management—The Tidelands: Legislative Apathy vs. Judicial Concern*, 8 U. SAN DIEGO L. REV. 695, 706-712 (1971).
116. 11 Cal. App. 3d at 51, 89 Cal. Rptr. at 905, *quoting from* Miller v. Board of Public Works, 195 Cal. 477, 484, 234 P. 381, 383 (1925) (citations omitted).
117. 11 Cal. App. 3d at 571-72, 89 Cal. Rptr. at 905-06.

offered no rebuttal to his assertion that his property would be rendered worthless by the ban on filling.

No clear trend seems to have emerged from the coastal development cases decided so far. Although it remains to be seen whether most jurisdictions will adopt the view of the *Candlestick* case or whether they will adhere to the position of the *Johnson* court, the requirements of substantive due process may substantially limit the regulatory policies of at least some states. Therefore, other control mechanisms, such as taxation laws and land acquisition programs, may be necessary.

V. Policy Considerations and Coastal Zone Management

The importance of long-range planning in coastal zone management has been discussed. In order to be effective, this planning must include the identification of goals and the establishment of priorities among competing interests. Such a soundly-conceived policy would serve as a guide or framework for governmental action and gives coherence to regulatory efforts. The national significance of the coastal zone and its problems demand the development of a national coastal zone policy. The following discussion deals with federal coastal zone policy, although parts may also be germane to state policymaking.

A. Competing Interests

In a highly developed society, decisions concerning the use and allocation of coastal resources may affect other social or economic interests. A responsible coastal zone policy, therefore, must include a means of resolving conflicts between ecological interests, and the needs arising out of the maintenance of adequate housing, transportation, agriculture, commerce and economic growth, energy production, social justice, international relations and national security.

1. Energy Production.—The declining supplies of electric power, heating fuel, gasoline and oil, in the face of rising energy needs,[118] have raised fears of an impending energy crisis. Summer "brownouts" and inadequate supplies of heating fuel during winter cause widespread discomfort. Gasoline shortages are driving the independent dealer out of business and the price of gasoline up. A long-term energy shortage causes economic dislocation and impairs the quality of life for millions of Americans.

118. *See generally* Swindler, *The Role of Energy Conservation in a National Energy Policy*, 2 ENVIRON. AFFAIRS 280 (1972).

In dealing with this problem the government may (1) stabilize or reduce energy use at an acceptable minimum and utilize non-market mechanisms, such as rationing, to insure that everyone receives a pro-rata share of electric power and fuel; (2) encourage the development of new energy sources; or (3) encourage the accelerated development of existing forms of energy.

The first proposal contemplates the shift to a life-style requiring less energy. A return to existence in a less technical society, however, has little popular support.[119]

A more plausible approach would be the development of new sources of energy. Greater use of oil shale, solar energy and geothermal energy would hardly affect the coastal zone. Greater reliance on oil shale as a source of energy, however, could adversely affect the ecology of those western states where deposits are found. The problem with developing new sources of energy is that the coasts may be seriously damaged long before these new kinds of energy are widely used.

For the present, at least, the development of existing energy sources seems the most viable approach. A responsible coastal zone policy favors a solution to the energy crisis that involves the least harm to marine resources and other environmental interests. Consequently, it is necessary to determine the effect on the nation's coastal area of increased use of oil, coal, atomic power, hydroelectric power and natural gas. It also is necessary to distinguish between those consequences resulting from energy use and those from energy production, including the extraction of raw materials.

Petroleum products are one of the chief sources of energy in America. The use of petroleum products often causes ecological damage, the chief culprit being the gasoline engine. The use of natural gas as an energy source entails perhaps the least ecological risk, even though the building of pipelines may cause environmental damage and there is always the danger of explosion.

Almost every aspect of the production, transportation, refining and use of these products causes environmental harm in coastal areas. Offshore drilling, for example, has resulted in oil spills such as the celebrated Santa Barbara spill a few years ago and the recent spills from offshore rigs in the Gulf of Mexico.[120] Trans-

119. Comment, *Vehicle Emissions: An Overview*, 48 URBAN L.J. 805 (1971).
120. Walmsley, *Oil Pollution Problems Arising out of Exploitation of the Continental Shelf, The Santa Barbara Disaster*, 9 U. SAN DIEGO L. REV. 514 (1972).

portation of oil by sea can produce spectacular spills. The Torrey Canyon incident is an example. Also, the continuous slow seepage during the normal transfer of oil cargoes from ship to shore is damaging. The creation of large port facilities to service these supertanker fleets also produces environmental damage to the shoreline. Refineries located near the coast add to the pollution problem.

Using coal for fuel also leads to adverse environmental effects. In areas where coal is produced the land is often destroyed by "strip mining."[121] In areas where coal is used to produce electric power, the air is polluted by sulfur dioxide, nitrous oxide, particulates and other coal byproducts.[122] The pollution danger is more acute in coastal areas located near large urban centers.

While atomic power is a potentially inexhaustable source of energy, there remains the risk of exposure to radiation. Moreover, the discharge of heated water from power plants into nearby waters threatens fish and wildlife.[123] This danger is particularly acute in bays and estuarine areas.

Although hydroelectric power can be a cheap and non-polluting source of energy, the topography of many areas of the country is not suitable for the production of this means of power. In addition, the opinion in *Scenic Hudson v. FPC*[124] indicates that even hydroelectric power production is not without environmental impact.

Unfortunately, there is no existing energy source that does not impair, to some extent, the coastal and marine environment. The question of which energy source is least harmful for the coastal zone is further complicated by consideration of potential environmental damages in other areas and the effect of using a particular form of energy on other interests, such as international relations, economic growth, employment, transportation and national security. When national objectives conflict with one another, tradeoffs are inevitable. The function of a suitable coastal policy is to avoid unjustified harm to the coastal environment from these tradeoffs.

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121. Reitze, *Old King Coal and the Merry Rapists of Appalachia*, 22 CASE WEST. RES. L. REV. 650 (1971).
122. Hodgson, *Acute Health Effects Induced by Commonly Occurring Non-episodic Levels of Urban Air Pollution*, 48 URBAN L.J. 657 (1971).
123. Hill, *Thermal Pollution and its Control*, 2 ENVIRON. AFFAIRS 406, 408-10 (1972).
124. 354 F.2d 608 (2d Cir. 1965), *cert. denied*, 348 U.S. 941 (1966). *See also* Udall v. FPC, 387 U.S. 428 (1967).

2. *Residential Housing.*—The need for increased residential housing may conflict with the welfare of the coastal environment. Although Congress has recognized the importance of housing by establishing a national housing goal in the 1968 Housing and Urban Development Act,[125] it is unlikely that these housing requirements can be met. The President's Committee on Urban Housing estimated in 1968 that twenty million additional units would be needed by 1978. However, housing starts were averaging approximately 1.5 million per year.[126]

Coastal areas have always been regarded as desirable housing sites. The construction of residential housing in these areas, however, often causes substantial injury to coastal ecology. In beach areas shorelines are altered by the destruction of sand dunes and coastal vegetation and the construction of seawalls. As beachfront property becomes more expensive, multifamily dwellings, such as apartments and condominiums, become increasingly common. Such high-density uses of the land in beach areas create pollution and waste disposal problems that only governmental restrictions can prevent.

In addition, single family dwellings are still constructed in ecologically sensitive wetland areas. Such construction is particularly destructive when building sites must be created by landfill. Indeed, in the past twenty years filling by housing developers has destroyed about seven percent of the nation's most important estuarine areas.[127]

Housing needs arguably fall into the cateogry of "merit wants,"[128] which include the right to vote, and the rights to receive education, minimal food and clothing, and basic medical care. Society believes these rights are so fundamental that they should be available to all its members, regardless of ability to pay.[129] Accordingly, the goal of adequate housing for all Americans should be a high priority.[130] However, it is erroneous to conclude that the interests of the coastal environment should always be subordinated to housing needs. Housing goals would only

125. 12 U.S.C. § 1701(t) (1969).
126. REPORT OF THE PRESIDENT'S COMMISSION ON URBAN HOUSING, A DECENT HOME 3 (1968).
127. 1 COMMISSION ON MARINE SCIENCE, ENGINEERING AND RESOURCES, SCIENCE AND ENVIRONMENT III, at 39 (1969).
128. R. MUSGRAVE, THE THEORY OF PUBLIC FINANCE 13-14 (1959). *But see* Caldwell, *Environmental Policy in a Hypertrophic Society*, 11 NAT. RES. J. 417 (1971); Lowry, *Toward a Radical View of the Ecological Crisis*, 1 ENVIRON. AFFAIRS 350 (1971).
129. *See generally* Tobin, *On Limiting the Domain of Inequality*, 13 LAW & ECON. J. 263 (1970).
130. Gurnsey, *Race Riots and Eco-Activism*, 2 ENVIRON. LAW 368 (1972).

outweigh coastal interests if the housing problem is due primarily to the unavailability of land for development purposes rather than to shortages of construction materials and consumer funds.

As long as there are other areas that may be used as housing sites, the needs of housing should not directly conflict with those of coastal zone management. Moreover, if there are proper land-use controls, such as coastal setback lines, density restrictions, and dredge and fill limitations, residential housing construction can be allowed in many coastal areas without destroying the environment.

3. Agriculture.—The recent dramatic rise in the price of food underscores the continued importance of agriculture in the American economy. Food is also a "merit want," and no government can afford to let food supplies fall below "need" levels or allow food prices to become unreasonably high. The export of food abroad positively influences America's international balance of trade and foreign relations. It is clearly in the public interest, therefore, to see that agricultural production remains adequate to meet foreign and domestic demand. However, the high productivity of American agriculture is due to extensive use of chemical fertilizers and insecticides. These practices are harmful to the coastal and marine environment.

The phosphates and nitrates in chemical fertilizers, washed away by runoff, ultimately find their way into both fresh and salt waters[131] where they often cause damaging algae growth. The resulting eutrophication destroys fish and plant life in the waterbody. Eutrophication is a particular hazard to estuaries and enclosed coastal waters. Poisonous insecticides and pesticides used in agriculture are often carried great distances by the wind, and are entering marine food chains in measurable quantities.[132]

Agricultural production must be maintained at present, if not higher, levels. Unless more land is devoted to farming, it is not realistic to abandon the use of these substances and accept a lower yield per acre. Instead, attention should be given to the development of fertilizers and insecticides that will not harm the environment.

4. Other Conflicting Interests.—A number of other interests may conflict with the welfare of the coastal environment. For instance, in competition with environmental concerns are the objectives of transportation and national security.

131. Street, *Agriculture and the Pollution Problem,* 1970 UTAH L. REV. 395, 397-8 (1970).
132. Schacter & Serwer, *supra* note 10, at 99.

More information is needed to assess the extent of the conflict between the needs of transportation and coastal zone interests. The construction of highways, airports and port facilities has adverse impact on the coastal environment. Transportation needs are in conflict with coastal zone interests because of the effect on the coastal zone of air pollution produced by motor vehicles.

The requirements of national security conflict with coastal concerns. The construction and operation of military bases near coastal areas, the operation of naval vessels, the disposal of chemical and radioactive wastes in the sea, and the testing of military weapon systems may all cause harm to marine life.

Tradeoffs among differing environmental interests is necessary. Occasionally, the interests of the coastal environment may have to give way to pragmatic concerns of these other areas. For example, a decision to reduce air pollution may require the importation of low-sulfur petroleum products despite the increased risk of coastal water pollution. Also, a decision to reduce air pollution by switching from electric power to atomic power plants may increase thermal pollution in neighboring areas.

B. In Search of Policy Criteria

The previous discussion focused on some of the conflicting interests that must be considered in the formulation of a responsible national coastal zone policy. This subsection will consider how conflicts among competing objectives may be resolved, and the significance environmental interests should be given in the policymaking process.

Neither the Coastal Zone Management Act nor the National Environmental Policy Act require preservation to be given top priority. These acts merely require that environmental interests receive due consideration in the policymaking process.

However, the Coastal Zone Management Act contains a certain amount of environmental rhetoric. One provision speaks of a national policy "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations."[133] Another portion of the Federal Act acknowledges an "urgent need to protect and give high priority to natural systems in the coastal zone."[134] Finally, legislative findings relate the importance of "living marine re-

133. 16 U.S.C.A. § 1452(a) (Supp. 1973).
134. *Id.* § 1451(g).

sources and wildlife," "ecological, cultural, historic, and esthetic values," and "special natural and scenic characteristics."[135]

The statute, however, also speaks of "requirements for industry, commerce, residential development, recreation, extraction of mineral resources and fossil fuels, transportation and navigation, and waste disposal."[136] There appears to be nothing in the statute that calls for the adoption of a policy that subordinates these interests to those of environmental protection.

The same observation can be made about the National Environmental Policy Act, the basic source of congressional policy with respect to environmental matters. A provision of the Act states:

> [I]t is the continuing policy of the Federal Government . . . . to use all practicable means and measures . . . . in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements or present and future generations of Americans.[137]

This language, while recognizing the significance of environmental interests, acknowledges that social and economic values also deserve consideration in formulating the course of action best guaranteed to contribute to the general welfare. Other parts of the Act are similarly qualified in their treatment of environmental values.

One possible yardstick that could be used to measure competing interests is the principle of efficiency.[138] A coastal zone management policy based on efficiency criteria would endeavor to maximize coastal resources rather than simply promote a few values, and would encourage the use of cost-benefit analysis as a means of determining the desirability of a particular regulatory scheme. This does not mean that other considerations, including environmental values, might not sometimes outweigh efficiency determinations. A policy based on efficiency criteria does imply, however, that developmental interests are entitled to the same consideration as environmental interests.

Should such a policy be characterized as developmental or preservationist? While in theory, efficiency criteria are neutral, it is

135. *Id.* § 1451(d), (e).
136. *Id.* § 1451(c).
137. 42 U.S.C. § 4331(a) (Supp. 1973).
138. For a discussion of the concept of efficiency see McKeon, *Products Liability: Trends and Implications*, 38 U. CHI. L. REV. 3, 24-42 (1970).

undeniable that a policy based on such criteria would have some developmental bias, since environmental and other nonpecuniary interests cannot be adequately considered in conventional cost-benefit analysis.[139]

Therefore, it will be necessary for economists to develop better tools for dealing with costs and benefits. The process of cost-benefit analysis also requires accurate data about causal relationships. Unfortunately, little is presently understood about the complex relationships that exist between urban land use, coastal areas and living marine resources. In particular, more research is needed on the effect of pollution and shoreline alteration on marine food chains. Until these relationships are better understood, coastal management policy should proceed cautiously when dealing with the marine environment.

Responsible policymaking must also take into account distributional factors. Not only should the benefits of a particular governmental action exceed its costs, but where possible, these costs should be allocated in such a way as to cause minimum social and economic dislocation. Costs, to the extent that they are not offset by corresponding benefits, should be spread among as large a group as possible. Moreover, these costs should not fall disproportionately upon those who can least afford to pay them.[140]

Distributional effects deserve particular consideration when the goal of preservation interfers with "merit wants." For instance, any scheme of coastal management which reduces housing opportunities for the poor should be re-examined in light of distributional as well as efficiency criteria. Nor should a concern for the coastal environment lead to the wholesale prohibition of chemical fertilizers and insecticides until adequate substitutes are available. Total prohibition would cause food prices to rise drastically. Any aspect of coastal zone management that creates substantial localized unemployment may be undesirable, even if coastal environmental interests are advanced.[141] While distributional criteria should not always control, these considerations should be accorded considerable weight by policymakers.

This section concludes with a caveat that the formulation of a responsible coastal zone management policy is an exceedingly

139. Hazleton, *Public Policy for Controlling the Environment*, 48 URBAN L.J. 631, 641 (1971).

140. This is based on the diminishing marginal utility theory of money. *See generally* G. CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS 39-41 (1970).

141. Faramelli, *Perilous Links Between Economic Growth, Justice, and Ecology: A Challenge for Economic Planners*, 1 ENVIRON. AFFAIRS 218 (1971).

complex matter. Since man's knowledge of coastal phenomena is still inadequate in many respects, flexibility should be built into coastal zone management policy. Nevertheless, it is urged that a body be appointed and funded to develop and enforce coastal zone policy. The provisions of the Coastal Zone Management Act provide a basis for both federal and state governments to take this first step.

VI. CONCLUSION

The coastal zone with its marine environment is rich in biological and mineral resources as well as possessing substantial recreational and aesthetic value. Because the ecology in many areas of the coastal zone is imperiled by man, there is reason to believe that the use made of the land is often a misallocation of resources.

The conditon of the nation's coastal areas will continue to decay unless a meaningful governmental response is made. In view of the critical nature of the problem, immediate implementation of the following proposals is recommended:

1. A more explicit national coastal zone management policy should be articulated by Congress. A federal agency with expertise in coastal matters should develop an elaborate federal policy.

2. Each coastal state should develop through appropriate legislation a coastal zone management program that would provide for comprehensive planning. Such a plan must include sufficient regulatory authority to control coastal land use and related activities.

3. Each coastal state should formulate a long-range coastal policy related to its management program.

4. Finally, Congress should provide adequate funding for the administration of the Coastal Zone Management Act of 1972.

The first proposal requires the formulation of a national coastal zone policy. Since the welfare of the coastal environment and the development of coastal resources is in many respects a matter of national significance, there should be a national policy that is equally responsive to national and local considerations.

The basic elements of this policy should be formulated by Congress and embodied in legislation. Accordingly, it is recommended that the Coastal Zone Management Act be amended to

provide for a more explicit statement of congressional policy with respect to coastal matters. Such a policy statement should specify how competing interests are to be balanced.

However, legislation can provide only an outline of congressional policy and it remains for administrative agencies to elaborate and refine the statutory material. Since the administration of the federal act has been committed to the National Oceanic and Atmospheric Administration, it would be appropriate for Congress to also delegate the policymaking function to NOAA.

The second proposal relates to the need for state coastal zone-management programs to insure that use of the coastal zone will proceed along planned and rational lines. Instead of the piecemeal approach that now prevails in many states, comprehensive management should be devised to cope with coastal problems. Substantial regulatory control should be placed in the hands of a centralized state agency, instead of being vested in municipal officials. Thus state and regional interests will be reflected, as well as local objectives.

While the content of each management program will vary according to the specific needs of each respective state, each program should include a provision for long-range planning and a system of land-use controls utilizing some of the regulatory devices examined in Part IV. It is anticipated that each state's taxation policies, land acquisition plans, as well as other governmental activities will complement and reinforce the objectives of the coastal management program.

The third proposal provides that each state develop a coastal zone policy. Such a policy would establish objectives for the management program and lend coherence to the planning and regulatory effort. Although the state considerations may differ somewhat from the federal, the policy established by state legislatures and administrative agencies should seek to encourage an efficient allocation of coastal resources.

The final proposal concerns funding. Without the inducement of federal funds, many states would fail to develop effective coastal-management programs. Because the implementation of a national coastal zone policy may be compromised by inadequate funding, Congress should allocate sufficient funds to implement the provisions of the Coastal Zone Management Act and should allow participation by all interested states in the benefits of that legislation.

This Article has attempted to show that serious environmental problems exist in coastal areas and that immediate and far-reaching governmental action is urgently needed. Comprehensive coastal zone management appears to be the only effective solution. However, if such efforts in this area are to succeed, objectives and priorities must be clearly identified.